guard of current research when cryptogamic morphology or taxonomy is in question may lean a little on the established order when he sets foot among the angiosperms. While Dr. Vines' treatment of angiospermic taxonomy does not, on the whole, please the reviewer as well as that of Warming or Schimper or of the Engler-Prantl series, nevertheless this is a matter largely of individual opinion.

In conclusion, the Vines text-book is a remarkably strong and well-balanced work. Its peculiar excellences are in the generally modern point-of-view, the transparency of the style, the perfection of the terminology, the firm and logical grouping of the material, the compactness of the treatment—especially in the chapter on physiology—the introduction of exact morphological conceptions to take the place of vague, and the evidence of wide and painstaking research that appears upon almost every page. Students of botany are to be congratulated in the same breath with the author upon the completion of the book.

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Chemical Analysis of Oils, Fats, Waxes and of the Commercial Products Derived Therefrom. From the German of PROFESSOR DR. R. BENEDIKT. Revised and enlarged by DR. J. LEWKOWITSCH., F. I. C., F. C. S., Technical Manager at the Whitehall Soap Works, Leeds, England. Macmillan & Co., New York, publishers. Price, $7.00.

The threefold task of translating, revising and enlarging Dr. Benedikt's work 'Die Analyse der Fette und Wachsarten, 1892,' by Dr. Lewkowitsch has resulted in presenting those interested in the subject the best and most complete work on Fats, Oils and Waxes. It is rarely that one finds the work of the translator so excellently performed. Almost every page bears the evidence of additions and alterations. The little work of the first publication of Dr. Benedikt has now grown into a large volume of almost 700 pages, an evidence of the numerous researches that have been made in this subject. Much of the work that we are accustomed to see in older works is here omitted, and we find it replaced by the results of more modern thought. We cannot accuse Dr. Lewkowitsch of publishing the work from other books, for at the end of almost every chapter the writer gives his experience with the various methods proposed and advises which one should be accepted, showing that this work is the result of many years' investigation. This method is most gratifying to the chemist, for assisted by the advice of such an authority much otherwise needlessly wasted time is saved.

The chapter on Physical and Chemical Properties of Fats and Waxes is very complete. Who is it who will not be thankful to Dr. Lewkowitsch for giving us concisely the result of the many publications on the rancidity of fats? "Rancidity (says Dr. L.) must, therefore, be considered due to direct oxidation by the oxygen of the air, this action being intensified by exposure to light." The table on p. 50 giving the percentages of free fatty acids in oils and fats of vegetable origin is new and is of special interest. Some of the oils, when freshly pressed from the seed, present so small a percentage that we may assume that these fats as well as the animal fats originally exist as absolutely neutral glycerides. Almost all works on fats and oils—as does this one—assert that "Fats can be heated to 250° C without undergoing any change." This I think most men who handle fats and oils practically will be forced to deny. No matter how carefully the fat has been refined to free it from all foreign matter, after being subjected to such heat it no longer possesses its original physical properties.

Lard or tallow will assume the appearance of a soft grease.

The part of the work devoted to the Quantitative Analysis is excellently written, disclosing at once that the author is thoroughly familiar with the work. The latest researches are carefully quoted and criticised, the criticisms being usually strengthened by results obtained in his own laboratory. We refer the reader especially to Twitchell's method for the determination of Resin Acids. On p. 196 he says: "Of all the methods proposed hitherto for the estimation of resin acids in mixture with fatty acids, that recommended by Twitchell yields the best results, and should therefore be used to the exclusion of the methods described before. The results, however, must not be considered as absolutely correct; they are only approximate, as Lewkowitsch has shown by an exhaustive examination of both the volumetric and gravemetric processes." The author then gives a series of tables giving the results of this work. Dr. Lewkowitsch's assumption that the reason for the results by this process, being only approximate, is due to the action of hydrochloric acid upon the resin, has since the publication of this work been shown to be wrong. Evans and Beach in a recent publication have shown that the low results obtained by the gravemetric process is due to a large percentage of unsaponifiable matter in the resin. They found as high as 9 per cent. of unsaponifiable matter in one resin.

The Chapters IX., X., XI. and XII. are almost entirely rewritten and contain much original work. The sulphur chloride test for drying oils offers many interesting points of inquiry. In the table given on p. 228 we find that tallow and lard do not thicken with S_2 Cl_2, and that the resulting product is entirely soluble in carbon bisulphide, whereas on p. 229 we find in another table that tallow oil and lard oil (products obtained by pressure from tallow and lard) solidify with S_2 Cl_2 after 12 and 10 minutes respectively and form products not completely soluble in carbon bisulphide. In summing up the results of the various investigations on 'Color Reactions,' Dr. Lewkowitsch said that the results on all color reactions should be taken with the greatest caution and mention should be made that the test for cotton seed oil with nitric acid which the author so forcibly recommends be included. The descriptions of the various oils, fats and waxes are very complete. The part given to cotton seed oil is especially so. In this one description we find twenty-three different publications referred to, including articles from American, English, German, French and Italian journals.

We are very sorry to find Dr. Lewkowitsch follows the footsteps of so many European chemists, decrying everything foreign. We should be pleased to know his authority for the following: (p. 460) 'in America adulteration has become an openly acknowledged practice,' etc. It simply points out to the American reader the customary ignorance of foreigners regarding our laws on the subject of adulteration. In Chapter XII., devoted to Technical and Commerical Analysis, lard and lard substitutes are dismissed with two and one-half lines. It is upon this very subject that a well directed system of investigations is necessary, and to judge by the numerous cases of supposed adulterations at all times before the English courts, Dr. Lewkowitsch's works would be considered the better for it, and must be considered incomplete for the lack of it.

JOSEPH P. GRABFIELD.

CHICAGO, July 6, 1895.

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THE August number of the *American Journal of Science* opens with an article by